#11 Appeal Brief 1/13/04 + Panel

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BOARD OF PATENT APPEALS AND INTERFERENCES

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In re application of: Hetherington

Serial No.: 09/684,205 Group No.: 2673

Filed: October 6, 2000 Examiner: J. Nguyen

For: MOVING DIELECTRIC, CAPACITIVE POSITION SENSOR CONFIGURATIONS

APPELLANT'S CORRECTED APPEAL BRIEF

Mail Stop Appeal Brief
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Dear Sir:

In response to Notification of Non-Compliance dated December 4, 2003, Appellant submits herewith its corrected Appeal Brief.

I. Real Party in Interest

The real party and interest in this case is P.I. Engineering., a Michigan corporation, by assignment.

II. Related Appeals and Interferences

There are no appeals or interferences which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

III. Status of Claims

The present application was filed with 17 claims. Claims 18-26 were added in January 2003. Claims 4 and 13 have been canceled. Accordingly, claims 1-3, 5-12 and 14-26 are pending in this application. All are under appeal.

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IV. Status of Amendments Filed Subsequent to Final Rejection

Appellant attempted to file an after-final amendment simply for the purpose of placing the application in better condition for appeal. However, the Examiner did not enter the amendment on the grounds that "at least a newly amended claim 8 raises new issue that would require further consideration and/or search." The Board is invited to review the amendment attempted by the Appellant, since its purpose was only to remove certain functional language at the request of the Examiner.

V. Concise Summary of the Invention

This invention resides in a capacitive sensor configuration which is capable of determining position and/or velocity for rotary or linear translation using a movable dielectric coupled to an elongate member (Specification, page 7, lines 2-4). In contrast to existing devices which use potentiometers, optical couplers or electrical contacts to detect events or positions of devices, the use of a moving dielectric provides a low-cost, low-power, easy to manufacture and maintain input/output device applicable to the computer industry and other fields of endeavor (Specification, page 7, lines 4-8)

In a preferred embodiment, the movable dielectric is supported between a plurality of stationary signal-transmitting plates and at least one stationary signal-detecting plates (Specification, page 7, lines 9-11). By measuring the charge on the detecting plate, the capacitances of the assembly at a given point in time can be determined, and this measurement is used to solve for position of the dielectric element and elongate member. The calculations associated with the measurements are preferably carried out using a conventional microprocessor, the capabilities of which may be dedicated or shared to perform other functions associated with a piece of host equipment (Specification, page 7, lines 11-16).

In the broadest application, the apparatus can be used to measure the position or velocity of a variety of devices, including computer peripherals such as mice, keyboards, joysticks, and other input control panels and linear position measurement apparatus (Specification, page 7, lines 17-19). In the case of a joystick, a portion of the elongate member extends from a housing for user engagement. Z-axis control is also disclosed (Specification, page 7, lines 19-21). In the case of a mouse, a pair of orthogonally oriented elongate members are physically coupled to a rotating ball. Each member connects to its own dielectric disposed between signal-transmitting and detecting plates (Specification, page 7, line 21 to page 8, line 3).

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VI. Concise Statement of Issues Presented For Review

1. Are claims 25 and 26 anticipated by Shahoian, U.S. Patent No. 6,304091?

2. Are claims 1-3, 5-7, 10-12 and 14-26 unpatentable under 35 U.S.C. §103(a) over U.S. Patent No. 6,304,091 to Shahoian, in view of U.S. Patent No. 5,576,704 to Baker et al.?

3. Were claims 8, 9, 25-26 properly rejected under 35 U.S.C. §112, second paragraph?

VII. Grouping of Claims for Each Ground of Rejection Which Appellant Contends

Appellant believes the following groups of claims represent patentably distinct inventions which should be given independent consideration on appeal:

Group I: Claims 1-7 and 18-19, wherein claims 2-7 and 18-19 stand or fall with claim 1;

Group II: Claim 10;

Group III: Claims 11-17, wherein claims 12-17 stand or fall with claim 11;

Group IV: Claim 20;

Group V: Claims 21 and 23, which stand or fall together;

Group VI: Claims 22 and 24, which stand or fall together; and

Group VII: Claims 25 and 26, which stand or fall together.

VIII. Argument

1. Claims 25 and 26 are not anticipated by Shahoian, U.S. Patent No. 6,304091, or rendered obvious by the Shahoian/Baker combination

Group VII contains claims 25 and 26, which stand or fall together. These claims were rejected under 35 U.S.C. §102(b) over Shahoian et al. Although Appellant's attempt to amend this claim to include the word "stationary" was not entered by the Examiner, it should be clear from the application as filed, and from the record, that the word stationary is not required to distinguish over Shahoian in terms of anticipation.

It is noted that according to Shahoian, the dielectric 107 is actually bonded to one of the

movable electrodes 110, a physical configuration which is structurally and functionally different from that of Appellant since, among other reasons, Appellant's capacitor plates are "supported on either side of the dielectric element." Anticipation may be established only when a single prior art reference discloses, expressly or under principles of inherency, *each and every element* of a claimed invention. RCA Corp. v. Applied Digital Data Systems, 730 F.2d 1440, 1444, 221 USPQ 385, 388 (Fed. Cir. 1984). Moreover, anticipation requires the presence of all elements of a claimed invention as arranged in the claim, such that a disclosure "that 'almost' meets that standard does not 'anticipate'." Connell v. Sears, Roebuck Co., 722 F.2d 1542, 1548, 220 USPQ 193, 198 (Fed. Cir. 1983).

Claims 25 and 26 were also rejected under 35 U.S.C. §103(a) over Shahoian, U.S. Patent No. 6,304,091 in view of Baker et al., U.S. Patent No. 5,576,704. Claim 25 resides in a capacitive position sensor configured for interconnection to a utilization device, comprising a non-circular dielectric element rotatable in a plane perpendicular to an axis of rotation; a pair of electrically conductive capacitor plates, one supported on either side of the dielectric element, neither plate consuming an entire radial area around the axis of rotation; circuitry ... to (a) measure the capacitance between the capacitor plates, and (b) determine the rotational position of the dielectric element as a function of the measured capacitance; and an output for communicating the rotational position to the utilization device.

It is noted that although the Examiner has lumped claims 25 and 26 into the rejection under 35 U.S.C. §103(a), no specific argument on the part of the Examiner has been advanced with respect to these claims. Thus, the claims of this group should be deemed non-obvious over the cited references for this reason alone. But in addition, the limitations of claim 25 would not result from the proposed combination, thereby defeating *prima facie* obviousness. In particular, the Examiner's rejection under 35 U.S.C. §112, notwithstanding, claim 25 includes the limitation of capacitor plates which do not consume an entire radial area around an axis of rotation, along with other elements of that claim and combination. Neither Shahoian nor Baker disclose such a limitation, such that the combination fails as a legitimate grounds for rejection under 35 U.S.C. §103.

2. Claims 1-3, 5-7, 10-12 and 14-26 are not obvious over Shahoian and Baker

Group I - Claims 1-7 and 18-19, wherein claims 2-7 and 18-19 stand or fall with 1.

Claim 1 stands rejected under 35 U.S.C. §103(a) over Shahoian, U.S. Patent No. 6,304,091 in

view of Baker et al., U.S. Patent No. 5,576,704. Shahoian is directed to a low-cost, high-resolution capacitive position sensor based upon a variable capacitance. A vane moves parallel to a stator, where a dielectric is interposed between vane and stator, such that the vane overlaps at least a portion of the stator, creating a capacitance that varies as the vane moves relative to the fixed stator. The capacitor circuit outputs a signal having a phase shift relative to an input driver signal based on the relative positions of the vane and stator. The phase-shifted signal is used to derive the absolute position of the vane with respect to the stator. Two or more stators can be provided to provide two phase-shifted signals and a difference signal free of common mode effects. Enhanced embodiments include interdigitated stator portions for greater sensing resolution, and/or a two or three-pole filter to double or triple the dynamic range of the sensor.

Baker, on the other hand, resides in a joystick including a control shaft having an operator handle and a base. A cardan joint (118) is used to pivotally mount the control shaft to the base, and an actuating body is rigidly attached to the control shaft. A plurality of electrically non-contacting sensors are provided to sense the relative position of the shaft relative to the base. The sensors include a pair of spaced apart electrodes establishing an electrostatic capacity with each other, and a dielectric body being disposed between the electrode pair. Accordingly, as the control shaft pivots, the actuating body engages the dielectric body which moves the dielectric body relative to the electrode pair thereby modifying the capacitance of the sensor.

According to the Examiner, "the difference between the Shahoian reference and the invention defined in claims above is a stationary [sic] of the signal detecting capacitor plate." That is part of the difference, but perhaps more importantly, Appellant's invention as claimed in this group uses a *moving dielectric* between two stationary plates. Claim 1 includes limitations of a signal-detecting capacitor plate and a signal-transmitting capacitor plate *both of which are stationary*. Appellant's dielectric element is movable, however, using a member is to shift the element in the X or Y directions in a plane substantially parallel to the stationary plates as a function of user position.

Shahoian et al. neither teach nor suggest any such structure or function and, in fact, in all of the embodiments of Shahoian, not only does an electrically conductive plate, but a dielectric plate which is either attached to the movable plate or the stationary plate (See, for example, Shahoian at column 4, lines 45-48).

Given this basic misunderstanding, the Examiner goes on to argue that it would have been obvious "to utilize Baker's teaching and the device of Shahoian, i.e., providing Shahoian's the signal detecting capacitor plate being stationary, because this would prevent wide voltage fluctuations and variations in the signals to be sensed between the signal detecting capacitor and the electronics circuit, occurred due to the movement of the signal detecting capacitor plate, thereby producing an accurate position of the user manipulandum [sic] or joystick handle."

As best understood, Appellant respectfully disagrees with this argument on the grounds that the motivation to combine has nothing to do with the theory postulated by the Examiner, but rather, must come from the prior art itself. In rejecting claims under 35 U.S.C. §103, the Examiner must provide a reason why one having ordinary skill in the pertinent art would have been led to modify the prior art, or to combine references, to arrive at Appellant's claimed invention. There must be something *in the prior art* that suggests the proposed modification, other than the hindsight gained from knowledge that the inventor choose to combine these particular things in this particular way. Uniroyal Inc. v. Rudkin-Wiley Corp., 837 F.2d 1044, 1051, 5 USPQ2d 1434, 1438 (Fed. Cir. 1988). The Examiner is also required to make specific findings on a suggestion to combine prior art references. In Re Dembeczak, 175 F.3d 994, 1000-01, 50 USPQ2d 1614, 1617-19 (Fed. Cir. 1999).

In this case, Shahoian et al. propose a perfectly reasonable physical structure to carry out possession sensing by phase-shift sensing using a variable capacitor, namely, the use of a moving electrically conductive plate, and a dielectric bonded either to that plate or to an opposing stationary plate. Although Baker et al. disclose a dielectric, it is in the form of a cylindrical body 140 disposed in the annular space defined by a pair of concentrically spaced electrodes. The dielectric body 140 includes a radially extending disc-shaped section 143 and a rod member 145. The disc-shaped section 143 and rod member 145 are integrally formed with the cylindrical portion of the dielectric body 140. (See Baker at column 3, lines 11-16.) Not only can Appellant find no teaching or suggestion whatsoever that the combination of Shahoian and Baker "would prevent wide voltage fluctuations ... occurred due to the movement of the signal-detecting capacitor plate ..," there is no motivation to combine these references apart from Appellant's own disclosure, and even if the references were to be combined, there is no way of knowing what the practical result of the combination would be. Accordingly, the Examiner has failed to establish *prima facie* obviousness with respect to this group of

claims.

Given that independent claim 1 should be allowable, dependent claims 2, 3 and 5-10 should be deemed allowable as well. As per claim 11, the same logic applied to claim 1 applies here as well, in that the signal-detecting capacitor plate and signal-transmitting capacitor plate are both recited as "stationary," with a movable dielectric disposed therebetween. Thus, some of the same distinctions made in comparing claim 1 to the Shahoian/Baker combination apply here as well, with additional limitations that are neither taught nor suggested by the prior art.

Group II - Claim 10.

Claim 10 is a method claim, which comprises, *inter alia*, the step of providing the position sensor of claim 1, placing the signal-detecting plate at a known electrical potential, then performing steps [a) through e) in the claim]. According to the Examiner, Shahoian in view of Baker further teaches this claimed subject matter, referring to Shahoian's Figure 3A and "the corresponding description." However, Figure 3A of Shahoian is simply "a schematic diagram of a practical embodiment of the sensor of the present invention," and the "corresponding description," presumably at column 7, lines 15-59 does not teach or even remotely suggest the steps of Appellant's method. Rather, apart from the fact that Appellant's invention utilizes a moving dielectric between stationary electrodes, an oscillator 60 provides the drive signal of a desired frequency (e.g., 500 kHz in the described embodiment) for an RC circuit formed from two real variable capacitors C1 and C2, each including a resistor R1 and R2. The resistors are driven by the same frequency, so that any change in frequency is canceled out. The steps of storing capacitor plates to known potentials, and repeating certain measurements as a function of such stored measurements are not to be found in this reference. Accordingly, the rejection of claim 10 is simply unsupported.

Group III - Claims 11-17, wherein claims 12-17 stand or fall with claim 11.

Claim 11 is an independent apparatus claim, including numerous limitations, only one of which is mentioned in passing by the Examiner. "Regarding to [sic] claims 11, 12 and 24, these claims recite limitations similar to those of claims 1, 2 and 22 above, except these claims further recite a housing having a top surface." This is clearly not the only additional limitation included in claim 11 over claim

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1, for example. Claim 11 further includes a limitation of a joystick supported for pivotable movement and having a proximal end for user engagement and a distal end which extends through the top surface to at least one of the signal-detecting and signal-transmitting plates enabling a lateral shift .... Not only has the Examiner failed to establish *prima facie* obviousness with respect to the claims of this group for the reasons set forth with respect to the claims of Group I, but the Examiner has failed to consider certain other important limitations that must be taken into account as part of a legitimate rejection.

Group IV - Claim 20.

Claim 20 adds to claim 1 the additional limitation that the segments of the signal-transmitting plate are arranged as parallel segments in one direction, and such that manipulation of the member causes the dielectric element to laterally shift in that direction relative to the parallel segments. These limitations are applicable to the embodiment of Appellant's directions set forth in Figures 11, 13 and 14, for example. According to the Examiner, "regarding to claim 20 [sic] as applied to claim 1 above, Shahoian in view of Baker further teaches the claimed subject matter (see Shahoian, Figure 3A). " Again, Figure 3A is simply a schematic diagram of a practical embodiment of the sensor of the Shahoian invention, and, moreover, although vane 56 is movable, **is an electrode and not a dielectric**. Indeed, single vane 56 is connected to ground 58 (see the '091 patent, column 7, lines 20-22). Clearly, the Examiner has misread the Shahoian reference, and has failed to establish *prima facie* obviousness with respect to this group of claims.

Group V - Claims 21 and 23, which stand or fall together.

Claims 21 and 23 include the limitation that the distal end of the elongate element is loosely coupled to the dielectric element so that the dielectric element remains in a plane substantially parallel to the stationary plates as the dielectric element is laterally shifted. According to the Examiner, "regarding to claims 21 and 23, Shahoian in view of Baker further teaches the claimed subject matter (see Baker, Figure 1)." Figure 1 is a cross-section of the entire apparatus of Baker, and nowhere does this show an elongate element having a distal end which is loosely coupled *to a dielectric element.* Accordingly, the Examiner has once again failed to establish *prima facie* obviousness.

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Group VI - Claims 22 and 24, which stand or fall together.

The claims of this group include the limitation that the movement of the dielectric element is constrained by the spacing of the stationary plate so that the dielectric element remains in a plane substantially parallel to the stationary plates as it is laterally shifted. Not only does the Shahoian/Baker combination fail to teach or suggest the use of a moving dielectric between stationary electrodes, there is no language whatsoever in either reference regarding the movement of a dielectric in a plane substantially parallel to the stationary plates due to a physical constraint.

3. Claims 8, 9, 25 and 26 are acceptable under 35 U.S.C. §112, second paragraph

Initially, it is noted that claims 8 and 9 stand rejected only under 35 U.S.C. §112, second paragraph, since there appears to be no other rejection of these claims on the merits. Accordingly, assuming these claims pass muster under 35 U.S.C. §112, second paragraph, they are otherwise allowable.

Claim 8 (and 9) include the limitation of "...elongate members ... supported at right angles to one another to measure movement in x and y dimensions." Apart from the fact that Appellant attempted to remove functional language from this claim, it is Appellant's opinion that the language of the claim would be clear to anyone of skill in the art. Referring to Figure 8, for example, elongated members are supported at right angles to one another, so that as ball 820 rotates, movements in the X and Y dimensions can be recorded to provide a function such as the movement of a cursor on a two-dimensional screen display, or the like. Based upon this clear disclosure, Appellant is of the opinion that the claims of this group are allowable.

Claim 25 (and 26) include the limitation of "neither plate consuming an entire radial area around the axis of rotation." Again, such language would be clear to anyone of skill in the art. This simply means that neither plate forms a continuous electrical path around the axis of rotation; in other words, along at least one line extending radially out from the axis of rotation, each plate contains a discontinuity. There is clear disclosure for this limitation, which speaks for itself.

Conclusion

In conclusion, for the arguments of record and the reasons set forth above, all pending claims of the subject application continue to be in condition for allowance and Appellant seeks the Board's concurrence at this time.

Respectfully submitted,

By: _____

Date: Jan. 5, 2004

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APPENDIX A

CLAIMS ON APPEAL

1. A capacitive position sensor configured for interconnection to a utilization device, comprising:

a stationary signal-detecting capacitor plate;

a stationary signal-transmitting capacitor plate supported parallel to, and spaced apart from, the signal-detecting capacitor plate, the transmitting capacitor plate being divided into a plurality of electrically separated segments;

a dielectric element disposed between the signal detecting and signal-transmitting capacitor plates;

an elongate member having a user-manipulable proximal end and a distal end coupled to the dielectric element, the member being operative to laterally shift the element in the x or y directions in a plane substantially parallel to the stationary plates as a function of user position;

circuitry in electrical communication with the stationary plates, the circuitry being operative to (a) measure the capacitance between each segment of the signal-transmitting plate and the signal-detecting plate, and (b) determine user position in the x or y directions as a function of the measured capacitance; and

an output for communicating the user position to the utilization device.

2. The position sensor according to claim 1, wherein the utilization device is a computer.

3. The position sensor according to claim 1, wherein the elongate member is a user-graspable joystick.

5. The position sensor according to claim 1, wherein the dielectric element is non-circular, enabling the circuitry to determine user rotation of the elongate member with or without laterally shifting of the dielectric element.

6. The position sensor according to claim 1, wherein the segments of the signal-transmitting plate are arcuate.

7. The position sensor according to claim 1, wherein the dielectric element is a circular disc.

8. The position sensor according to claim 1, further comprising:

a pair of assemblies, each including a stationary signal-detecting capacitor plate,

a stationary segmented signal-transmitting capacitor plate, a dielectric element disposed between the plates, and an elongate member rotationally coupled to the dielectric element; and

wherein the elongate members are supported at right angles to one another to measure movement in x and y dimensions.

9. The position sensor according to claim 8, wherein the assemblies form part of a computer mouse including a rotational ball physically couple to the elongate members.

10. A method of sensing position, comprising the steps of:

providing the position sensor according to claim 1 and placing the signal-detecting plate at a known electrical potential, then:

a) placing one of the signal-transmitting plates at a first electrical potential;

b) changing the potential on the signal-transmitting plate to second known potential;

c) measuring and storing the capacitance between the signal-transmitting plate and the signal-detecting plate;

d) repeating steps a) through c) for each segment of the signal-transmitting plate; and

e) determining the position of the dielectric element and elongate member as a function of the stored capacitance measurements.

11. A capacitive-based joystick configured for interconnection to a utilization device, comprising:

a housing having a top surface;

a stationary signal-detecting capacitor plate disposed within the housing;

a stationary signal-transmitting capacitor plate disposed within the housing parallel to, and spaced apart from, the signal-detecting capacitor plate, the transmitting capacitor plate being divided into a plurality of electrically separated segments;

a dielectric element disposed within the housing between the signal-detecting and signal-transmitting capacitor plates;

a joystick lever supported for pivotal movement having a proximal end for user engagement and a distal end which extends through the top surface of the housing and at least one of the signal-detecting and signal-transmitting capacitor plates, enabling the lever to laterally shift the dielectric element in x and y directions in a plane substantially parallel to the stationary plates as a function of user position;

circuitry in electrical communication with the stationary plates, the circuitry being operative to (a) measure the capacitance between each segment of the signal-transmitting plate and the signal-detecting plate, and (b) determine user position as a function of the measured capacitance; and

an output for communicating the user position to the utilization device.

12. The joystick according to claim 11, wherein the utilization device is a computer.

14. The joystick according to claim 11, wherein the dielectric element is non-circular, enabling the circuitry to determine user rotation of the lever with or without laterally shifting of the dielectric element.

15. The joystick according to claim 11, wherein the segments of the signal-transmitting plate are arcuate.

16. The joystick according to claim 11, wherein the plurality of electrically separated segment includes 3 or 4 arcuate segments.

17. The joystick according to claim 11, wherein the dielectric element is a circular disc.

18. The position sensor according to claim 5, wherein the dielectric element is oval or egg-shaped.

19. The position sensor according to claim 1, wherein the plurality of electrically separated segment includes 3 or 4 arcuate segments.

20. The position sensor according to claim 1, wherein:

the segments of the signal-transmitting plate are arranged as parallel segments in one direction; and

manipulation of the first end of the member causes the dielectric element to laterally shift in that direction relative to the parallel segments.

21. The position sensor according to claim 1, wherein:

the elongate member includes a pivoting coupling between the first and second ends; and

the distal end of the elongate element is loosely coupled to the dielectric element so that the dielectric element remains in a plane substantially parallel to the stationary plates as the dielectric element is laterally shifted.

22. The position sensor according to claim 1, wherein:

the movement of dielectric element is constrained by the spacing of stationary plates so that the dielectric element remains in a plane substantially parallel to the stationary plates as the dielectric element is laterally shifted.

23. The joystick according to claim 11, wherein:

the elongate member includes a pivoting coupling between the first and second ends; and

the distal end of the lever is loosely coupled to the dielectric element so that the dielectric element remains in a plane substantially parallel to the stationary plates as the dielectric element is laterally shifted.

24. The joystick according to claim 11, wherein:

the movement of dielectric element is constrained by the spacing of stationary plates so that the dielectric element remains in a plane substantially parallel to the stationary plates as the dielectric element is laterally shifted.

25. A capacitive position sensor configured for interconnection to a utilization device, comprising:

a non-circular dielectric element rotatable in a plane perpendicular to an axis of rotation;

a pair of electrically conductive capacitor plates, one supported on either side of the dielectric element, neither plate consuming an entire radial area around the axis of rotation;

circuitry in electrical communication with the capacitor plates, the circuitry being operative to (a) measure the capacitance between the capacitor plates, and (b) determine the rotational position of the dielectric element as a function of the measured capacitance; and

an output for communicating the rotational position to the utilization device.

26. The capacitive position sensor according to claim 25, wherein:

the dielectric element is coupled to a scroller wheel; and

the utilization device is a computer.